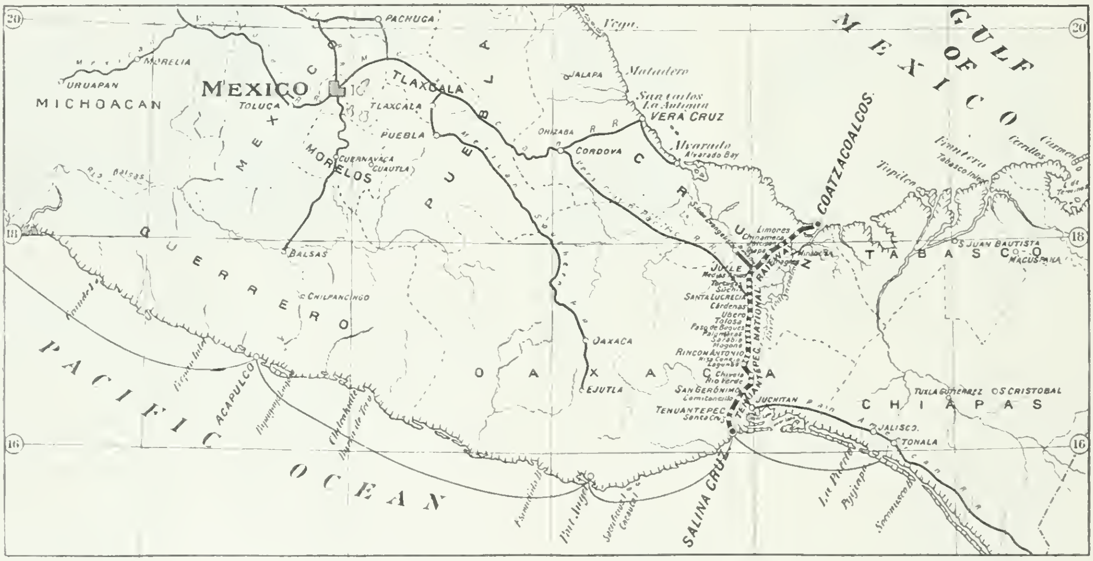
The Tehuantepec National Railway.

While the type of canal to be adopted at Panama has only lately been decided upon, and its completion will probably require from eight to ten years, the Tehuantepec National Railway, which is to accomplish, though in another way, the same results commercially as the Panama Canal, is now almost ready to be put in complete operation for through traffic. In the *Railroad Gazette* of July 15, 1904, E. L. Corthell, who had himself been associated with a similar project, described the long and interesting history of the attempt to make a satisfactory line of communication across the Tehuantepec isthmus. The project was commented on editorially in our issue of July 28, 1905, at the time when the announcement was made that the American-Hawaiian Steamship Company had concluded a contract with the Tehuantepec National Railway for operation of connecting steamship lines on both the Pacific and Atlantic oceans. Through the courtesy of S. Pearson & Son, Limited, of London, joint lessees with the Mexican Government of the road, we are enabled to present late facts in regard to the present state of the route and two new official maps of the railroad and its connections.

The Tehuantepec National is 189 miles long and runs from Coatzacoalcos, on the Gulf of Mexico, south across the Isthmus to the Pacific port of Salina Cruz. The present contract on which the firm of S. Pearson & Son, Limited, is now engaged has involved the entire reconstruction of the railroad from end to end, in order to put it in shape for heavy traffic, and the construction of notable harbor works at each of the two terminals. The railroad had previously been built piecemeal across the Isthmus and was of poor construction, entirely unsuited to heavy traffic.



The Tehuantepec National Railway, Showing Railroad Connections.

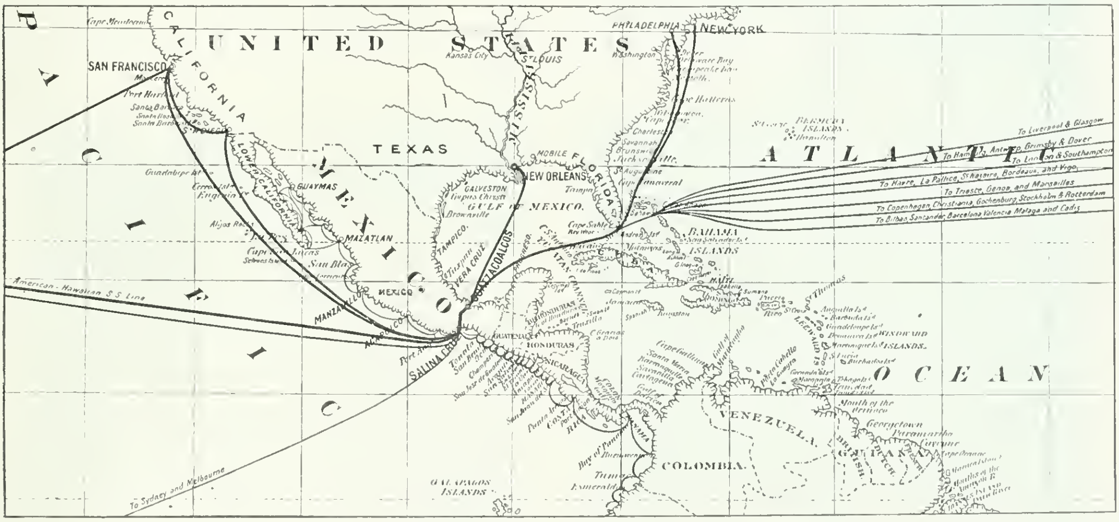
The line as reconstructed has been improved throughout. Gradients have been reduced to a maximum of 1.6 per cent., compensated, and curvature to a maximum of 11 deg. 40 min. The line rises gradually from the Atlantic terminus, reaching a maximum elevation above sea level of 855 feet at Niza Conejo, and thence drops quickly to sea level again at the Pacific at Salina Cruz. The rails, originally 56-lb., have been replaced by 80-lb. rails of the Am. Soc. of C. E. section. Ties are spaced 13 to 14 to a 30-foot rail length. Some ties are native hardwood, but most of them are creosoted American pine or California red wood, with Lewis tie plates. Two-thirds of the road is ballasted with crushed rock 12 to 1 in. deep, the remainder with gravel. There is only one short tunnel on the line. There are, however, a number of bridges, all of the recent ones having been designed for consolidation engines with 44,000 lbs. on the driving axles and train loads of 4,000 lbs. per foot. One of the largest bridges is at San Lucretia, 9 miles from the Atlantic terminus, where the Vera Cruz & Pacific joins the Tehuantepec line. It is over the Jaltepec river. This is a five-span steel lattice girder, Pratt type bridge 560 ft. long, with masonry abutments. Most of the more important bridges are of this type, though the plate girder type is also used. The smaller bridges are built with lattice half through girders and the smallest of all with plate deck girders. Culverts on the northern end of the line are concrete; on the central and southern parts, masonry. The number of bridge openings was originally 838, spanned mostly by timber structures. By filling up trestles and replacing small bridges with culverts the number of bridge openings has been reduced to 257, all of which have iron or steel superstructures. Both consolidation and 10-wheel locomotives are largely in use, and all engines are being fitted, if not originally so designed, for the use of oil fuel. At present, most of the oil is imported from Texas, but it is planned to use the mineral oil found on the Isthmus, which is now being exploited and developed.

The headquarters of the road are at Rincon Antonio, a new town 125 miles from the Atlantic and 68 miles from the Pacific terminus. Here large new buildings have been built for the use of the staff and employees. The road includes a 16-mile branch running to San Juan Evangelista. Over the Vera Cruz & Pacific there is connection with the railroads of Mexico and the United States. One problem which has made difficult the operation and reconstruction of the road is the rapid growth of the tropical vegetation. Instead of going to the expense of removing the growth every few weeks, the company has made use of a chemical compound which permanently destroys it. This effects a saving of about $12,000 a year. The roots of the plants as well as the growth above ground are completely killed by this chemical, which is applied hot in liquid form from a tank car which is heated by coiled steam pipes and the chemical spread by steam pressure through an atomizer.

In the reduction of grades and curvature some heavy construction work was done. The line passes through several gorges or canyons where deep rock cutting and steep embankment work were necessary; for instance, 10 miles in the Malatango canyon and 24 miles in the Chivla Pass, the latter the highest land between the two oceans. Here the track is in two horseshoe curves and there is the only tunnel on the line. Here also the maximum gradients and curvature for the rest of the line are exceeded, the grade rising to 2.7 per cent. and the curvature to a maximum of 21 degrees 40 minntes.

Hardly second to the large amount of work necessary on the line of the railroad has been the improvement of the two harbors. The plan provides for a depth of water at the terminal wharves in each ocean of 32 ft. 9 in. at low water. At Coatzacoalcos on the Atlantic side the Coatzacoalcos river empties into the ocean, and through the silt and debris which is brought down, the bar at the mouth of the river between the extensive deep basin inside and the deep water outside normally had about 14 feet of water on its crest. The channel was deepened to 32 ft. 9 in., but a rise in the river in two weeks shoaled the channel to 14 feet. In order to make and keep the channel clear two permanent jetties of stone and concrete blocks are being built, converging from a width of 3,445 ft. at the shores to 919 ft. at the sea ends. By means of these jetties it is expected that the current in the river instead of spreading out and forming a bar will be confined in a narrower channel and wash the silt out into the deep water beyond. The railroad terminal at this point includes wharves extending for 3,640 ft. along the west bank of the river, of structural steel, supported by 6-inch solid steel piles decked with timber. Behind the wharves are five sheds 400 ft. by 110 ft. The wharves are equipped with 12 electric cranes of 3 tons capacity and electric capstans for handling cars, together with railroad tracks leading out to the railroad. Five of the wharves are now ready and fully equipped. The training walls are nearly finished. There is already plenty of deep water in the river and alongside the wharves and there is soon to be 30 ft. over the bar at the mouth of the river.

Salina Cruz, instead of being at the mouth of a river, is open to the waves of the Pacific. A long curved shore line with, on the west, a promontory of porphyry rock 245 ft. high jutting out into the sea, has been used as a brace to which to tie a breakwater made out of the rock of the bluff. The stone blasted off has been used as the foundation of a massive work formed of huge concrete blocks put in place by a powerful Titan crane which moves on the completed work. As the water deepens rapidly, the dike will rest at its end in about 59 ft. of water. A similar dike is being built on the east side and when completed there will be an entrance about 650 ft. wide between the two. The east jetty is built by carrying the materials along the shore from the promontory and depositing them by a second Titan crane. These two massive breakwaters, thrown out like giant protecting arms into the sea, will form the outer harbor, or harbor of refuge. The east breakwater is to be five-eighths of a mile long and the west breakwater about 1,900 ft. long. The largest quarry block yet handled for the breakwaters weighs 56½ metric tons. The real harbor will be an inner basin which will be reached by a passage from the outer harbor and in which there will be still water. This harbor will be wholly artificial, occupying on the shore the former site of the old town of Salina Cruz. Excavation of the inner basin is being done by two dredges, one having a 24-in. and the other two 20-in. centrifugal pumps by which sand is pumped into hoppers on the boats which then go out to sea and dump it in deep water. The basin will be about 3,280 ft. long by 728 ft. wide, with 32 ft. 9 in. depth of water at low tide. The entrance, which will be in the dividing wall for passage of ships from the outer harbor to the inner basin, will be 98 ft. wide and will be spanned by two swing bridges. On each side of the entrance three warehouses will be built and tracks will be laid on the wharves for handling freight between rail and ship, assisted by traveling electric cranes. Vessels are to moor alongside the wharf within the basin. The wharves are on the south side of the enclosed tidal basin, the quay wall being formed of concrete monoliths sunk in place and coped with granite. This quay has sheds, electric cranes and capstans similar to the equipment of the wharves at Coatzacoalcos. On the opposite side of the basin a graving dock 590 ft. long and 98 ft. wide by 31 ft. deep is in course of construction. At Salina Cruz, berths for two 12,000-ton steamers are now ready and further wharfage accommodations will soon be available. The harbor works at both these terminals are now far enough advanced to permit the largest ocean-going steamers with perfect safety in all weathers to discharge alongside the wharves direct into cars or warehouses. At both terminals accommodations can be increased almost indefinitely.



The Tehuantepec National Railway, Showing Steamship Connections.

The following steamship lines already call regularly at Coatzacoalcos and Salina Cruz: Compania Mexicana de Navegacion, Cia. Nevira de Pacifico, Cuban Steamship Line, Pacific Mail and Cosma Steamship Company. When the two terminal harbors are opened for interoceanic traffic the America-Hawaiian Line will divide its steamers now running between New York and Hawaii via the straits of Magellan into two fleets, one giving regular service between Hawaii, San Francisco and Salina Cruz on the Pacific and the other a weekly service on the Atlantic between New York and Coatzacoalcos. In addition, all steamship lines now running from Europe to Mexico plan to give direct service to Coatzacoalcos and steamship connections are to be established at Salina Cruz with all the Pacific Coast ports of Central and South America as far south as Valparaiso. As indicating the saving in distance which can be effected by use of the Tehuantepec route, the following table is given:

Distances in Nautical Miles.

		Via Tehuantepec.	Via Panama.
New York	to San Francisco	4,226	5,495
	Acapulco	2,363	3,613
	Mazatlan	3,017	4,055
	Yokohama	8,666	9,835
	Honolulu	5,699	6,688
New Orleans	to San Francisco	3,091	4,700
	Acapulco	1,262	2,861
	Mazatlan	1,759	3,458
Liverpool	to San Francisco	7,182	8,038
	Acapulco	5,274	6,035
	Honolulu	8,511	9,263
	Yokohama	11,478	12,500

This shows that the average saving in distance by the Tehuantepec route over Panama to all points on the Atlantic Coast of the United States and Europe is about 1,250 miles. The ordinary freight steamer makes about 250 miles a day, which would mean five days longer via Panama, assuming the time of crossing the two isthmuses to be the same. To pass through the Panama canal will probably take a steamer about a day, while it is expected to send freight across the Tehuantepec isthmus from ship to ship in two days. This would leave four days to the advantage of Tehuantepec.

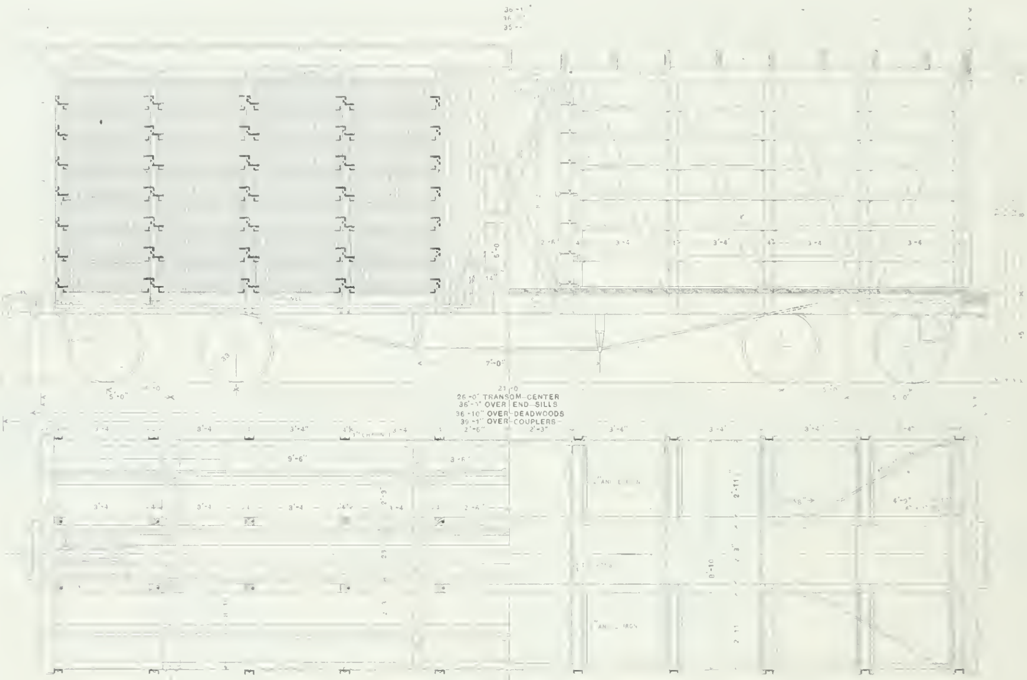
The project is being carried on under a partnership contract extending for 51 years from July 1, 1902, between the Mexican Government and S. Pearson & Son, Limited, of London. The contractors are the managers of the company's affairs. The working capital is to be furnished in equal shares by the two parties to the contract. The surplus earnings after payment of all expenses, fixed charges and losses is to be divisible between the government and the contractors as follows: During the first 36 years, 65 per cent. to the Government and 35 per cent. to the contractors, with slightly increased percentages going to the Government during the remainder of the contract. At the close of the 51-year period the property is turned over to the Mexican Government. In May the Mexican Congress passed a law authorizing an increased expenditure of $12,250,000 to be used in completion of the port works at Coatzacoalcos. Extracts from the law are as follows:

"Article 1. The Executive of the Union is empowered to take $5,000,000 from the treasury reserves, and a sum not exceeding $2,000,000 from the surplus to be obtained in the current fiscal year of 1905-1906, for the exclusive purpose of paying the cost of the works which are being executed at the ports of Salina Cruz and Coatzacoalcos, in accordance with the contract promulgated on January 24, 1900.

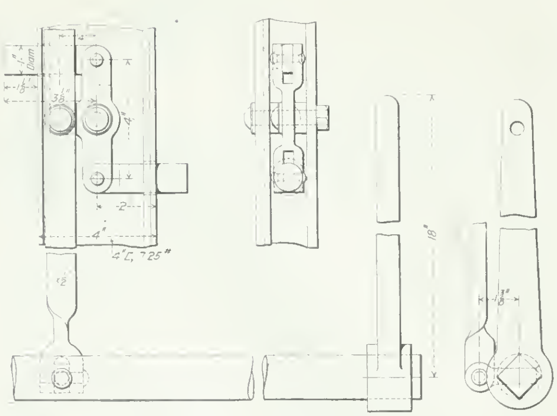
"Art. 2. The Executive is also empowered to emit, in the course of the fiscal years 1906-1907, 1907-1908 and 1908-1909, interest bearing treasury notes, running for not more than two years. The proceeds of these notes will be devoted to the payment of the works referred to in the foregoing article.

"Art. 3. On no account shall there be issued in one and the same fiscal year more than $4,000,000 of treasury notes, and the amount of those emitted in the years 1906-1907, 1907-1908 and 1908-1909, according to the second article of this law, shall not exceed $5,250,000.

The total cost of the port works at Coatzacoalcos and Salina Cruz is estimated at $65,000,000. About $35,000,000 has already been spent, leaving $30,000,000 still to be provided for. To provide this sum in the most convenient manner is the object of the bill.



Bundy Live Poultry Car.



Lock for Live Poultry Car.

End Elevation and Cross-Section.

The management of the railroads of Alsace-Lorraine, which are the property of the German Empire, has notified its employees that it regards two associations (socialistic) of railroad employees, known as the "Railroaders of Germany" and the "South German Railroad Union," as hostile to public order, and that membership or support of either will be considered incompatible with service on the Imperial railroads, and will be cause for dismissal from the service. In the place where this notice was first posted, where there are railroad shops, one of these organizations is said to have 900 members.

A New Live Poultry Car.

A new kind of live poultry car is illustrated by the accompanying drawings. To permit the coops to be inserted and withdrawn from the outside, the side frame bracing is transferred to a position at the back of the coops over the intermediate sill next the center sill. The side posts are 4-in. channels riveted to channel iron side sills and plates and the coops slide on angle irons riveted to these posts. Additional strength is given the side frame by an X brace of channel irons riveted to the side sill and plate in the space ordinarily occupied by the door opening. The car has a center aisle 27 in. wide and end doors the width of the aisle and 6 ft. high. Small side doors, 5 ft. high and 28 in. wide, are also put there in front of the X braces, as a matter of convenience. The car holds 112 coops, giving it a capacity of 6,720 chickens.

The coops are locked in place by a special locking device, a drawing of which is shown. All of the locks on one side of the car are thrown by a single lever at the middle of the car lengthways. The principal advantages of the coop arrangement are the ease with which it can be removed and cleaned and replaced, thus making it easy to keep the coops and the car in sanitary condition. There are troughs on the aisle side of the coops and overhead is a water tank with pipes to the troughs for watering the poultry in transit. The car was designed by Mr. C. L. Bundy, Superintendent of the coach department of the Hicks Locomotive & Car Works, Chicago Heights, Ill.